

Patent Claims:

1. A method for alignment and for exposure of a semiconductor wafer with a structural pattern in an exposure device,
5 comprising the following steps:
 - a) provision of the semiconductor wafer with at least one exposure field, on which a first layer is arranged, in which is formed in each case at least one alignment mark for aligning a semiconductor wafer in the exposure device for
10 exposure of the exposure field,
 - b) formation of a measurement structure with a first locational position in the exposure field in the first layer,
 - c) application of a chemical or physical process at least to the exposure field with the measurement structure,
 - 15 d) measurement of a second locational position of the measurement structure after the application of the process,
 - f) comparison of the first and second locational positions for determining a difference which characterizes the influence of the applied process on the first distance in the exposure
20 field,
 - g) loading of the semiconductor wafer into the exposure device and alignment of the semiconductor wafer using the at least one alignment mark for defining an exposure position for the exposure field,
 - 25 h) correction of the exposure position of the exposure field in the exposure device depending on the difference for compensating for the influence of the applied process,
 - i) carrying out of the exposure with the corrected exposure position,
 - 30 k) repetition of steps a) to i) for correction of at least two further exposure fields, the corrections respectively applied having a nonlinear dependence on the position of the first and of the in each case at least one further exposure field on the semiconductor wafer.

2. The method as claimed in claim 1, characterized in that the correction of the exposure position of the exposure fields in each case
- 5 - is carried out in a manner equal to the difference in terms of the magnitude,
- is carried out in a manner opposite to the difference in terms of the direction.
- 10 3. The method as claimed in either of claims 1 and 2, characterized in that a chemical mechanical polishing process of the semiconductor wafer is carried out for the application of the process.
- 15 4. The method as claimed in either of claims 1 and 2, characterized in that the chemical or physical process is carried out as a deposition process for depositing a second layer in such a way that the measurement structure is discernible in the second
- 20 layer.
5. The method as claimed in claim 4, characterized in that
- 25 - a second measurement structure is formed at a first distance from the first measurement structure in the exposure field in the first layer,
- after the deposition of the second layer, the second measurement structure is etched free in an etching step from the second layer for the purpose of defining a reference
- 30 structure,
- a second distance between the first measurement structure in the second layer and the second structure in the first layer is determined during the measurement of the second locational position,

- the first distance is compared with the second distance during the comparison for determining the difference.

5 6. The method as claimed in one of claims 1 to 5, characterized in that the measurement of the locational position is carried out using a scanning electron microscope.

10 7. The method as claimed in either of claims 1 and 2, characterized in that the measurement of the locational position is carried out by determining the electrical resistance of a measurement structure.

15 8. The method as claimed in one of claims 5 to 6, characterized in that the first and second measurement structures are formed in a kerf region of an exposure field comprising at least one electrical circuit to be formed.

20 9. A method for alignment and for exposure of a first semiconductor wafer with a structural pattern in an exposure device, comprising the following steps:

- 25 a) provision of a second semiconductor wafer with at least one first exposure field, on which a first layer is arranged and in which is formed in each case at least one alignment mark for aligning a semiconductor wafer in an exposure device for exposure of the exposure field,
- 30 b) formation of a measurement structure with a first locational position in the first exposure field in the first layer,
- c) application of a chemical or physical process at least to the first exposure field with the measurement structure,

d) measurement of a second locational position of the measurement structure after the application of the process,
f) comparison of the first and second locational positions for determining a difference which characterizes the influence of the applied process on the first distance in the exposure field,
g) provision of the first semiconductor wafer with a second exposure field for carrying out an exposure in an exposure device, the second exposure field having the same relative position on the first semiconductor wafer as the first exposure field on the second conductor wafer,
h) alignment of the first semiconductor wafer using the at least one alignment mark for defining an exposure position for the second exposure field,
i) correction of the exposure position of the second exposure field in the exposure device depending on the determined difference for the purpose of compensating for the influence of the applied process,
k) correction of the exposure position of the exposure field in the exposure device depending on the determined difference for the purpose of compensating for the influence of the applied process,
l) repetition of steps a) to k) for correction of at least two further exposure fields, the corrections respectively applied having a nonlinear dependent on the position of the respective exposure field on the first semiconductor wafer.

10. The method as claimed in claim 9, characterized in that the correction of the exposure position of the second exposure fields in each case

- is carried out in a manner equal to the difference in terms of the magnitude,
- is carried out in a manner opposite to the difference in terms of the direction.